What is claimed is:

1. A method, comprising:

depositing Mg onto a surface of an underlayer to form a Mg layer thereon, wherein the surface is selected to be substantially free of oxide, and the underlayer includes at least one layer of magnetic material selected from the group consisting of ferromagnetic materials and ferrimagnetic materials;

directing additional Mg, in the presence of oxygen, towards the Mg layer to form a MgO tunnel barrier in contact with the underlayer, the oxygen reacting with the additional Mg and the Mg layer; and

annealing the MgO tunnel barrier to improve its performance.

2. The method of Claim 1, wherein the magnetic material is bcc and is selected to be at least partially (100) oriented to improve the performance of the tunnel barrier.

3. The method of Claim 2, wherein the magnetic material includes an alloy of Fe and Co, and the Fe content of the alloy is between 1 and 99 atomic %.

4. The method of Claim 3, wherein the magnetic material is in direct contact with the MgO tunnel barrier.

5. The method of Claim 3, wherein the underlayer includes a spacer layer that separates the magnetic material from the MgO tunnel barrier.

6. The method of Claim 1, wherein the Mg layer has a thickness of between 3 and 20 angstroms.

7. The method of Claim 1, comprising forming an overlayer on the MgO tunnel barrier to form a magnetic tunnel junction, wherein the overlayer includes a magnetic

material selected from the group of materials consisting of ferromagnetic materials and ferrimagnetic materials, and wherein the tunnel junction is annealed to increase its tunnel magnetoresistance.

8. The method of Claim 7, wherein at least one of the underlayer and the overlayer includes antiferromagnetic material that is exchange biased with ferromagnetic material of said at least one layer, the antiferromagnetic material including IrMn.

9. The method of Claim 7, wherein the magnetic material includes an alloy of Fe and Co.

10. The method of Claim 7, wherein at least one of the underlayer and the overlayer includes antiferromagnetic material that is exchange biased with ferromagnetic material of said at least one layer, the antiferromagnetic material including PtMn.

11. The method of Claim 7, wherein the tunnel junction is annealed at a temperature selected to yield a tunnel magnetoresistance of greater than 100% at room temperature.

12. The method of Claim 7, wherein the tunnel junction is annealed at a temperature selected to yield a tunnel magnetoresistance of greater than 140% at room temperature.

13. The method of Claim 7, wherein the tunnel junction is annealed at a temperature selected to yield a tunnel magnetoresistance of greater than 160% at room temperature.

14. The method of Claim 7, wherein the tunnel junction is annealed at a temperature in the range of 200 °C to 400 °C.

15. The method of Claim 7, wherein the tunnel junction is annealed at a temperature in the range of 350 °C to 400 °C.

16. The method of Claim 7, wherein the tunnel junction is annealed at a temperature selected to be greater than an annealing temperature at which the tunnel magnetoresistance of the tunnel junction is reduced.

17. The method of Claim 7, wherein the magnetic material of the overlayer and the magnetic material of the underlayer are both bcc and (100) oriented.

18. The method of Claim 17, wherein the magnetic material of the overlayer and the magnetic material of the underlayer are both in direct contact with the MgO tunnel barrier.

19. The method of Claim 18, wherein the MgO tunnel barrier is (100) oriented.

20. A method, comprising:

providing a ferromagnetic underlayer having a surface that is substantially free of oxide;

forming a Mg layer on the surface to both protect the underlayer from oxidation and to wet the underlayer; and

directing oxygen and additional Mg onto the Mg layer to form a MgO tunnel barrier that is in contact with the underlayer, wherein the ferromagnetic underlayer is selected to be bcc and at least partially (100) oriented to improve the performance of the tunnel barrier.

21. The method of Claim 20, comprising:

forming a ferromagnetic overlayer on the MgO tunnel barrier to form a magnetic tunnel junction; and

annealing the MgO tunnel junction to improve its performance.

22. The method of Claim 21, wherein the tunnel junction is annealed at a temperature selected to yield a tunnel magnetoresistance of greater than 100% at room temperature.

23. The method of Claim 21, wherein the tunnel junction is annealed at a temperature selected to yield a tunnel magnetoresistance of greater than 140% at room temperature.

24. The method of Claim 21, wherein the tunnel junction is annealed at a temperature selected to yield a tunnel magnetoresistance of greater than 160% at room temperature.

25. The method of Claim 21, wherein the tunnel junction is annealed at a temperature in the range of 200 °C to 400 °C.

26. The method of Claim 21, wherein the tunnel junction is annealed at a temperature in the range of 350 °C to 400 °C.

27. The method of Claim 21, wherein the ferromagnetic material of the overlayer and the ferromagnetic material of the underlayer are both bcc and (100) oriented.

28. The method of Claim 27, wherein the MgO tunnel barrier is (100) oriented.

29. The method of Claim 20, wherein the Mg layer has a thickness of between 3 and 20 angstroms.